Two-part cooling device

The present invention relates to refrigerating appliance which is especially provided for installation in a furniture cavity. Presently two different designs are widely used for these refrigerating appliances.

In a first design a machine compartment is recessed in a substantially rectangular heat-insulating housing which contains at least one compressor for the coolant circulating in the refrigerating appliance. A condenser for the coolant is mounted freely suspended on the rear wall of the insulating housing and is cooled by the convection of ascending air which heats up at the condenser.

In a second known design, with the exception of the evaporator, substantially all the components of the cooling circuit are accommodated in a base unit mounted fixedly below the housing. A very favourable ratio of volume to surface area of housing can thereby be achieved, resulting in a low requirement for cooling capacity; however, convection can no longer be used for removing the waste heat from such a base unit so that forced ventilation is required for this purpose. In addition, space occupied by the base unit in the fitting recess is lost to the users as storage space for other purposes.

It is the object of the present invention to provide a refrigerating appliance and assemblies for a refrigerating appliance which can achieve a high energy efficiency and at the same time allow available space in a fitting cavity to be utilised very economically.

It is a further object to provide a method for installing such a refrigerating appliance in furniture.

The objects are solved by a refrigerating appliance having the features of claim 1, assemblies having the features of claims 9 and 10 and a method according to claim 11.

Since in the refrigerating appliance according to the invention, the conventional fixed connection between the heat-insulating housing on the one hand and the base unit on the other

hand is eliminated, it is possible to accommodate both these units spatially separated from one another in largely arbitrary positions in relation to one another in furniture such as a kitchen cupboard. A readily accessible zone of the furniture can be selected for accommodating the first structural unit comprising the housing whereas the second structural unit comprising the compressor can be placed in a poorly accessible zone which is not very attractive for any other usage or in any case, would not be usable at all. Such a zone is especially the base area present in most kitchen furniture, immediately adjacent to the floor. The refrigerating appliance according to the invention has thus opened up space which has hitherto been unused, as so-called machine compartment whereby storage space is gained either for the refrigerating appliance or the built-in cupboard holding the refrigerating appliance.

In principle, it is possible to supply the two structural units of the refrigerating appliance according to the invention joined together ex works substantially only by a coolant pipe but not by rigid mechanical connection elements. This has the advantage that the coolant circuit of the refrigerating appliance can be joined together in a sealed fashion in the factory and that problems are avoided which can arise if the coolant circuit is only filled with coolant after the refrigerating appliance has been assembled at its installation site or if parts of the coolant circuit filled with coolant at the factory need to be joined together during assembly. Since such a connection makes it fairly difficult to handle the two assemblies of the refrigerating appliance during assembly, a coupling is preferably provided, however, in a coolant pipe connecting the two assemblies which makes it possible to mount the two assemblies separately from one another in the furniture and only join them together after assembly.

Such a coupling preferably consists of two portions, each attached to the pipe section of the first assembly or the second assembly and which are self-closing in the uncoupled state. Couplings of this type which are designed to prevent any escape of coolant in the uncoupled state are known from air conditioning. The use of these couplings means that the two portions of the coolant circuit of the refrigerating appliance according to the invention allotted to the first or to the second assembly, can be filled with coolant in the factory independently of one another and nevertheless an uncontrolled escape of coolant into the atmosphere can be prevented.

More appropriately the second assembly is fitted with forced ventilation so that it can also be built into zones of furniture which otherwise would only be inadequately cooled.

A condenser can in principle be provided as part of the first or the second assembly as desired. In particular, if the second assembly is forcibly ventilated, it is appropriate to integrate the condenser in the second assembly.

A condensation water pipe for removing moisture deposited in the interior of the housing is more appropriately guided in a line together with the coolant pipe. In such a case, the condensation water pipe is more appropriately provided with a coupling in the same way as the coolant pipe.

An evaporator tray at which the condensation water pipe ends is more appropriately integrated in the second assembly in order to use the waste heat released from the compressor for vaporising the water of condensation.

Further features and advantages of the invention are obtained from the following description of an exemplary embodiment with reference to the appended figures which show

Fig. 1 is a schematic section through a refrigerating appliance according to the invention built into a kitchen cupboard.

The built-in cupboard 1 shown in cross-section in Fig. 1 has a cavity 2 in its upper area which accommodates a first assembly 3 of the refrigerating appliance according to the invention. The first assembly 3 substantially comprises a heat-insulating housing comprising a body 4 and a door 5 which enclose an interior compartment 6 for the storage of chilled goods. In the figure the interior compartment 6 is shown as an example without subdivision and with a single evaporator 7 at its rear wall, naturally it could also be subdivided by dividing walls into a plurality of different temperature zones which can optionally each be fitted with their own evaporator which can be supplied with coolant independently of the evaporators of the other zones or it could be an appliance in a no-frost design where the evaporator is accommodated in a chamber which communicates from the interior via forced ventilation.

An intake pipe 8 and a drain pipe 9 for the coolant supply of the evaporator 7 are guided out at the back of the body 4 and end jointly at the coupling portion 10.

A collecting channel 11 for water of condensation draining from the evaporator 7 is formed at the back wall of the interior compartment 6 below the evaporator 7. A drain pipe 12 is guided out at the back of the body 4 starting from the lowest point of the collecting channel 11 and ends like the pipes 8, 9 at the coupling portion 10. The coupling portion 10 thus has three connector elements, one for each pipe 8, 9, 12, wherein at least the connector elements allocated to the pipes 8, 9 are self-closing in the unconnected state of the coupling portion 10 in order to prevent coolant from escaping from the evaporator 7 and the pipes 8, 9 into the open.

A second cavity 13 of the built-in cupboard 1 below the cavity 2 accommodating the first assembly 3 in this case contains two drawers 14. The cavity 13 is not cooled. Its depth is somewhat less than that of the cavity 2 so that between a rear wall 15 of the cavity 13 and a wall 16 on which the built-in cupboard 1 is mounted, a shaft 17 connecting the cavity 2 to a base cavity 18 of the cupboard 1 remains free.

In the base cavity 18, a second assembly 19 of the refrigerating appliance, for example, rests directly above the floor. This second assembly 19 comprises a compressor 20, a suction pipe 21 and a pressure pipe 22 which respectively connect the compressor 20 to a second coupling portion 23, a condenser 24 inserted in the pressure pipe 22 and a fan 25 which serves as forced ventilation for the compressor and the condenser 24.

The two coupling portions 10, 23 connect the drain pipe 9 to the suction pipe 21, the inlet pipe 8 to the pressure pipe 22 and the drain pipe 12 to a drain pipe 26 which discharges onto an evaporation tray 27 mounted on the compressor 20.

In the case of the second coupling portion 23 the connector elements allocated to the pipes 21, 22 carrying the coolant are self-closing when not connected.

The refrigerating appliance according to the invention is delivered from the manufacturer in the form of two assemblies 3 and 19 which are not connected to one another. Assembly is accomplished by first placing the first assembly 3 in a cavity 2 in a usual manner for a conventional refrigerator and then inserting the assembly 19 into the base cavity, e.g. from the front after a front plinth 28 of the base cavity has been temporarily removed. The two coupling portions 10, 23 are joined together at a suitable time, e.g., assuming that the pipes 8, 9, 12 are of sufficient length, after placing the first assembly 3 and guiding the pipes 8, 9, 12 and the coupling portion 10 through the shaft 17, by pulling the coupling portion 10 forward through the base cavity 17 and joining to the coupling portion 23 before pushing the second assembly 19 into its position.

The separation of the two assemblies 3 and 19 according to the invention allows the housing to be mounted at a height conveniently accessible for a user and at the same time to use the conventionally unused base cavity of the built-in cupboard 1 for accommodating the second assembly 19. Compared to the conventional designs of refrigerating appliances described initially, a volume of about 20 litre is thereby released in the cavity. That is, the building-in cavity can be reduced in height in accordance with this 20 litres whilst the volume of the interior compartment 6 remains the same, whereby additional space is provided for other purposes in the built-in cupboard 1 or the interior compartment 6 of the refrigerating appliance can be correspondingly enlarged whilst the dimensions of the cavity 2 remain unchanged.

Naturally, it is not necessary to mount the two assemblies 3, 19 of the refrigerating appliance according to the invention one above the other in a built-in cupboard. A laterally offset arrangement is also feasible depending on the available space. It is also possible to arrange the second assembly 19 above the first assembly 3, possibly in an area of the built-in cupboard near the ceiling which is likewise poorly accessible for a user in general. In such a case, it would be more appropriate to provide a pump in the drain pipe 9 or 26 to raise the water of condensation draining from the interior compartment 6 to the level of the evaporation tray 27.